

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-329369

(43)Date of publication of application : 15.12.1998

(51)Int.Cl.

B41J 5/30  
G06F 3/12

(21)Application number : 09-143616

(71)Applicant : NEC DATA TERMINAL LTD

(22)Date of filing : 02.06.1997

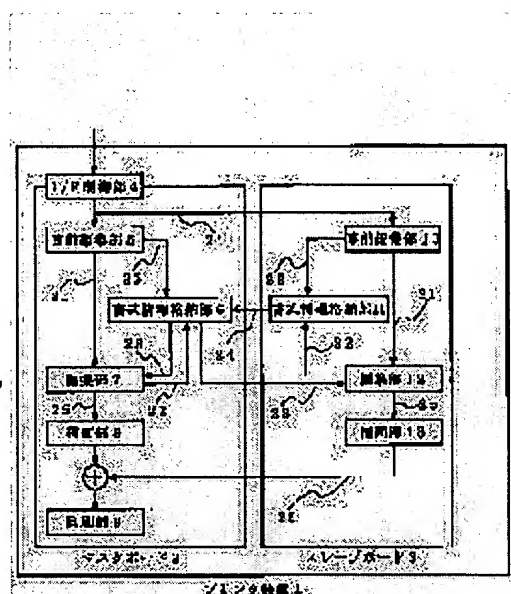
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## (54) PRINTER

### (57)Abstract:

PROBLEM TO BE SOLVED: To improve a performance of the printer by a method wherein editing and drawing are operated in parallel by each of CPUs by each page.

SOLUTION: Each of a master board 2 and a slave board 3 comprises preliminary editing sections 5, 10 that execute an operation for format information and a page completion control command before an editing operation, format information storing sections 6, 11 that store the format information of a page at a time before the editing operation, editing sections 7, 12 that execute a real editing operation by each page and drawing sections 8, 13 that execute a drawing operation. The master board 2 further comprises an I/F control section 4 that executes controlling of receiving of data from a host device and a printing section 9 that executes video data outputting and page management.



## LEGAL STATUS

[Date of request for examination]

02.06.1997

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or

application converted registration]

[Date of final disposal for application]

[Patent number] 2937945

[Date of registration] 11.06.1999

[Number of appeal against examiner's  
decision of rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the printer equipment which carries out parallel processing of the received data by each CPU per page.

[0002]

[Description of the Prior Art] There are JP,5-201077,A and JP,4-22648,A as an example this kind of technique is indicated to be. When performing parallel processing in a former official report, two or more drawing sections are prepared in it, and the method which aims at an improvement of the printing processing time is indicated by by carrying out parallel processing of the drawing processing according to the load of the drawing processing in the same page. Moreover, the method which carries out parallel processing of drawing processing and the printing processing to it per page when performing parallel processing in a latter official report is indicated.

[0003] When processing is explained with reference to a drawing, drawing 5 is the block diagram showing one example of the conventional technique. Drawing 6 is a timing diagram which shows actuation of one example of the conventional technique. The drawing management task 3210 and the individual drawing tasks 3211-3213 consist of another CPUs. The drawing management task 3210 is a method which detects only a drawing attribute parameter and a page break before real drawing in the form of empty drawing, passes data to the individual drawing tasks 3211-3213 per page, and performs parallel processing.

[0004]

[Problem(s) to be Solved by the Invention] When it is going to perform parallel processing in the conventional technique, in order to surely detect a page break from received data and to divide data per page, in the case of data without a page break, the load focused on one processor and there was a trouble that the engine performance fell.

[0005] It is because there is no page break, the division piece of a page is not known unless it comes out after actually editing when data carry out bottom margin over and carry out a newpage, and the information is not made to reflect in real drawing of degree page.

[0006] The purpose of this invention does not have a page break, prevents a load focusing on 1CPU which was dividing per page and carrying out parallel processing of the edit / drawing processing for every CPU also to received data which carry out a newpage by bottom margin over, and was a trouble in the conventional technique, and is to offer the printer equipment which raises the processing engine performance.

[0007]

[Means for Solving the Problem] The printer equipment of this invention carries out parallel processing of the received data by each CPU per page. More specifically, it has a means by which firmware performs retrieval of the form information of received data, and a page conclusion control code, a means to manage the form information of a 1 page [ of the page always processed by self-CPU ] before, and a means to process by arranging edit / drawing processing in parallel per page by two or more CPUs.

[0008] This invention is firmware and searches only received data to form information and a page conclusion control code rather than actual edit processing before. For this reason, it becomes possible to divide received data per page, and the processing after edit processing is arranged in parallel, and can be performed. Moreover, in order to take the synchronization of the searched form information, the centralized control of form information is performed by the CPU subordinate called a master board. By doing in this way, the newest (form information until 1 page before editing by self-CPU) can always be referred to under the command of CPU called a slave board.

[0009]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained with reference to a drawing.

[0010] Drawing 1 is the block diagram showing one example of the printer equipment of this invention, and drawing 2 is a timing diagram which shows actuation of one example of this invention. Reference of drawing 1 constitutes the printer equipment 1 of this invention from a master board 2 and a slave board 3. The master board 2 and the slave board 3 operate by separate CPU, and parallel processing is possible for them. Moreover, the difference on a configuration is the point that there is nothing on the slave board 3 to there being the I/F control section 4 and the printing section 9 in the master board 2.

[0011] Received data 21 are stored in a receive buffer through the I/F control section 4 of the master board 2 from a high order host. As for the stored data, detection of form information and a page conclusion control code is performed in the pre-edit sections 5 and 10. It has the pre-edit section in the master board 2 and the slave board 3 for retrieving information 1 page before the page which is going to perform edit processing in the editorial departments 7 or 12 after this, respectively. (However, since the data of a front page do not exist about the 1st page, nothing is processed.) This can distribute the load of processing of a pre-edit. Moreover, since the control-code information management and processing to search are performed by firmware, there is an advantage into which it can change easily.

[0012] The searched form information is stored in the form information storing sections 6 or 11. As information stored, the character decoration, a character size, alphabetic character line feed width of face, a typeface, a paper size, the printing direction, copy number of sheets, and the address that detected the control code about form and an external character from the receive buffer further are stored in a pointer format. Once such information is set up, it can consider a clear demand and the case where information is succeeded ranging over two or more pages since it is continued until another parameter is newly set up by the same control code. Therefore, a printing result will become inaccurate, when only a page conclusion control code is detected simply and the data for 1 page are made to process by another CPU. In order to prevent it, informational storing is needed in advance. As storing information on other, the information on whether edit processing was completed by the page conclusion control code and the received-data 21 throat top is stored in a pointer

format. The centralized control of such information is carried out in the form information storing section 6, and the information 1 page before starting edit processing from now on is stored. getting it blocked -- since one of CPUs always stores the information in front of 1 page, all the information on the page before starting edit processing will be stored in the condition of the information on past from the newest information.

[0013] In the editorial departments 7 and 12, edit processing is started with reference to received data 21 and the form information storing section 6. Edit is completed, in the case of the master board 2, it is stored in the form information storing section 6, and, in the case of the slave board 3, the edited receiving data address and form information which were updated are stored in the form information storing section 11. It is because not storing in the form information storing section 6 directly at the time of the slave board 3 overwrites information while other CPUs are referring to the information on the form information storing section 6, and it becomes the cause of malfunction. Therefore, when the edit processing other CPUs of whose are the last pages is finished and it stops referring to the information on the form information storing section 6, the form information transfer request 24 is received, the information on the form information storing section 11 is copied to the form information storing section 6, and an informational synchronization is maintained.

[0014] When the newpage of another purpose which stores the form information after the completion of edit is not carried out with page conclusion control command, but it is accompanied by the newpage by automatic carriage return and line feed, and you are going to make it print a big alphabetic character and bottom margin over is specifically carried out, the case where the result of having carried out automatic carriage return and line feed by right margin over is bottom margin over etc. corresponds to this. It is for preventing the edit starting position of degree page becoming inaccurate.

[0015] The edited data 25 generate video outlet data as drawn data 26 in the drawing sections 8 and 13. The printing section 9 performs that it carries out the DMA output request of the video data for the drawn data 26 to an engine to reception and sequence management of a page.

[0016] Actuation of one example of this invention is explained with reference to the timing diagram of drawing 2. It is the master board 2 about the 1st page, and drawing 2 is the slave board 3 about the 2nd page, henceforth, it is the master board 2 about a recto, and shows the case where an even-numbered page is processed on the slave board 3.

[0017] In the master board 2, in the pre-edit section 5, the received data 21 received by the I/F control section 4 shown in drawing 1 process nothing, but are passed to the editorial department 7. Moreover, the control code of the page [ 1st ] form information and a page conclusion is searched with the slave board 3. The timing to which the slave board 3 starts edit processing of the 2nd page is, after updating the address of the received data 21 which edit processing completed in the editorial department 7 of the master board 2, and the form information and edit which were changed after edit completed in the form information storing section 6. At this time, the form information reference demand 23 is received for the first time, and the slave board 3 starts edit processing in the editorial department 12 based on the information on the form information storing section 6, and the page [ 2nd ] received data 21.

[0018] The form information updated when edit was completed is once written in the form information storing section 11, when edit processing of the 1st page is completed

on the master board 2, the form information transfer request 24 is received, and the newest information is copied to the form information storing section 6 in the master board 2.

[0019] When the slave board 3 starts edit processing of the 2nd page, the master board 2 performs drawing processing for the data 25 edited [ page / 1st ] in reception and the drawing section 8 from the editorial department 7. Completion of drawing passes the drawn data 26 to the printing section 9. The printing section 9 performs a DMA output request for a video data to an engine. Next, it checks that the pre-edit processing of the 1st page from a slave board has been completed, and pre-edit processing of the 2nd page is started.

[0020] Henceforth, when pre-edit processing of the last page has ended pre-edit processing initiation timing and the video DMA output request of the last page is started, parallel processing in a page unit is performed, taking timing in the condition of the time of edit processing of the last page having completed edit processing initiation timing. Thus, the form information storing section 6 in the master board 2 has played the important role which takes the synchronization of not only the renewal of the form information after edit but pre-edit processing and edit processing initiation.

[0021] Next, the 2nd example of this invention is explained with reference to a drawing. Drawing 3 is the block diagram showing other examples of the printer equipment of this invention. Drawing 4 is a timing diagram which shows actuation of other examples of this invention. A different point from drawing 1 is a point that the slave board consists of n sheets. About timing, it is the same as that of drawing 2. However, although the sequence to process serves as a master board → slave board 1 → slave board 2 → slave board n-1 → slave board n → master board in drawing 4, since processing of degree page is performed in fact to the board which printing processing completed, it is irregular in the sequence of processing. By extending n slave boards like this invention, the processing engine performance per 1CPU becomes engine-performance/(master board (1)+ slave board (n)) in approximation. [0022] Furthermore, it is the approach of giving the printing section 9 to each slave board, connecting an engine to each as a modification of this example, and realizing processing speed of processing engine-performance x per 1CPU (board number of sheets). Moreover, as another modification, it is the configuration of a master board and three slave boards, and is the approach of making parallel processing carrying out to the condition of three primary colors (MAZENDA, yellow, cyanogen) and black for every color by searching color data as retrieval information which performs a pre-edit, and realizing improvement in the speed of color printing.

[0023]

[Effect of the Invention] Since the form information which edit processing of the form information to the last page detected by pre-edit processing and the present page completed this invention, and was changed is made to reflect in edit processing of degree page and the newpage by the bottom margin can also be recognized as explained above There is no page break, page management can be performed also to received data which carry out a newpage by bottom margin over, edit / drawing processing in a page unit is attained by this, and it has the effectiveness that the processing engine performance can be raised.

[0024] Moreover, this invention has the effectiveness that the load per 1CPU becomes engine-performance/(master board (1)+ slave board (n)) in approximation only by increasing the number of sheets of a slave board, without a load's being able to distribute equally and making a change on a configuration, since the processing in

connection with edit and drawing is the same as the ability to carry out the parallel processing of all the data per [ above-mentioned ] page with a master board and a slave board.

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[Translation done.]